# Trends in the epidemiology of asthma in England: a national study of 333,294 patients

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DECLARATIONS

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None declared

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## Summary

**Background** Observations in the UK at the end of the last century found increasing trends of asthma prevalence over time. However, it has been reported that the number of new cases of asthma presenting to general practice has declined, especially among younger children.

**Aim** To study national trends in the epidemiology of asthma.

**Methods** A cross-sectional observation analysis was performed using the QRESEARCH database, which is one of the world's largest national aggregated health databases containing records from 422 English practices yielding 30 million patient-years of observation. Data was extracted on 333,294 individuals with a recorded diagnosis of asthma and calculated annual age–sex standardized incidence, lifetime period prevalence and asthma-related prescribing rates for each year from 2001–2005.

**Results** The incidence rate of asthma decreased in all patients (2001: 6.9 (95% confidence intervals [CI] 6.8–7.0); 2005: 5.2 (95% CI 5.1–5.3) per 1000 patient-years, p<0.001), but most particularly in children under 5 years of age (–38.4%) where a decrease in the lifetime prevalence of asthma (–34.3%) was also found. However, the lifetime prevalence rate of asthma for adults increased (15–44 years: 23.3%; 45–64 years: 27.7%; >65 years: 21.5%) with an estimated 5,658,900 (95% CI 5,639,700–5,678,200) or approximately one person in nine having being diagnosed with asthma in England. The number of asthma-related prescriptions also increased over the study period (17.1%), such that in 2005 an estimated 32,577,300 (95%CI 32,531,600–32,623,000) prescriptions were issued.

**Conclusions** This large national study reveals that the rate of new diagnoses of asthma appears to have passed its peak; however, the number of adults with a lifetime asthma diagnosis continues to rise. Whether these trends are genuine or are a result of the introduction of incentives and guidelines to improve identification and recording of asthma or changing diagnostic trends is a question with important public health implications and one, therefore, that warrants detailed further enquiry.

EMIS practices and patients and for EMIS for providing technical expertise in creating and maintaining QRESEARCH. We thank QRESEARCH staff (Julia Hippisley-Cox, Govind Jumbu, Alex Porter, Justin Fenty, Mike Heaps and Richard Holland) for their contribution to data extraction, analysis and presentation. These findings have been reported in *Primary care epidemiology of allergic disorders: analysis using QRESEARCH database 2001–2006*, which is published by the NHS Health and Social Care Information Centre

## Introduction

Asthma is one of the most important chronic conditions in the UK, affecting patients' quality of life and posing a high level of burden on health services.[1] Observations in the UK at the end of the last century found increasing trends of asthma prevalence over time.[2,3] However, it has been reported that the number of new cases of asthma presenting to general practice has declined, especially among younger children.[4]

This study of national trends in the epidemiology of asthma was commissioned by the Chief Medical Officer for England because of growing concern about the high prevalence, disease burden and healthcare costs (£800 million [€880 million] annually) associated with asthma (and other respiratory disorders) and is being used to inform policy deliberations on allergy and respiratory service provision in England.[5]

## Methods

Version 10 of the QRESEARCH database was used for these analyses. This database contains broadly representative anonymized aggregated health data derived from 422 primary care practices throughout England. Data were available for each year during the period 1 January 2001–31 December 2005, these comprising of between 2.8 and 3 million individual patients who collectively contributed over 30 million patient-years of observation. All individuals resident in England (including children) are registered with primary care, which is free at the point of contact. The methods used to collect primary care data for the QRESEARCH database have been previously described.[6–9]

Patients were characterized by gender, age (under 5 years; 5–14 years; 15–44 years; 45–65 years; >65 years), deprivation (area-based Townsend deprivation quintiles), and were included in the analysis year if they were registered for the entire year of study. Patients with incomplete data (i.e. temporary residents, newly-registered patients and those who joined, left or died during the study year) were excluded.

The patients analysed in this study were considered to have asthma if they had a relevant computer-recorded diagnostic Read code (Box 1) in their electronic health record during the time period of interest (occupational asthma was not included in this analysis). Incidence was defined as the number of patients with a new case of asthma diagnosed in a specific year, with the denominator being the number of patient-years of observation (calculated from the number of patients registered with practices and their length of registration). Lifetime prevalence was defined as the number of people with asthma ever recorded on at least one occasion in the general practice (GP) records; the denominator used to calculate the lifetime prevalence rate was the number of patients registered

**Box 1**
**Asthma Read codes used in the analysis**

| *Read codes* | *Read term* |
|---|---|
| H33 | Asthma |
| H33-1 | Bronchial asthma |
| H330 | Extrinsic (atopic) asthma |
| H330-1 | Allergic asthma |
| H330-2 | Childhood asthma |
| H330-3 | Hayfever with asthma |
| H330-4 | Pollen asthma |
| H3300 | Extrinsic asthma without status asthmaticus |
| H3300-1 | Hay fever with asthma |
| H3301 | Extrinsic asthma with status asthmaticus |
| H3301-1 | Extrinsic asthma with asthma attack |
| H330z | Extrinsic asthma NOS |
| H331 | Intrinsic asthma |
| H331-1 | Late onset asthma |
| H3310 | Intrinsic asthma without status asthmaticus |
| H3311 | Intrinsic asthma with status asthmaticus |
| H3311-1 | Intrinsic asthma with asthma attack |
| H331z | Intrinsic asthma NOS |
| H332 | Mixed asthma |
| H333 | Acute exacerbation of asthma |
| H334 | Brittle asthma |
| H33z | Asthma unspecified |
| H33z-1 | Hyper-reactive airways disease |
| H33z0 | Status asthmaticus NOS |
| H33z0-1 | Severe asthma attack |
| H33z1 | Asthma attack |
| H33z1-1 | Asthma attack NOS |
| H33z2 | Late-onset asthma |
| H33zz | Asthma NOS |
| H33zz-1 | Exercise induced asthma |
| H33zz-2 | Allergic asthma NEC |
| H33zz-3 | Allergic bronchitis NEC |

**Table 1**
**Incidence and lifetime prevalence rates of asthma 2001–2005**

| *Year* | *Total patients (n)* | *Patients with asthma (n)* | *Age–sex standardized rate per 1000 patient-years (95% CI)* | *Relative % change in standardized rate (from 2001)* |
|---|---|---|---|---|
| *Incidence* | | | | |
| 2001 | 2,864,938 | 18,883 | 6.9 (6.8–7.0) | 0 |
| 2002 | 2,890,190 | 18,611 | 6.7 (6.6–6.8) | –2.7 |
| 2003 | 2,921,178 | 17,226 | 6.1 (6.1–6.2) | –11.0 |
| 2004 | 2,922,024 | 17,947 | 6.4 (6.3–6.5) | –7.8 |
| 2005 | 2,958,366 | 14,870 | 5.2 (5.1–5.3) | –24.4 |
| *Lifetime prevalence* | | | | |
| 2001 | 2,864,938 | 285,941 | 100.5 (100.1–100.9)* | 0 |
| 2002 | 2,890,190 | 301,048 | 104.8 (104.4–105.2)* | 4.3 |
| 2003 | 2,921,178 | 315,559 | 108.5 (108.2–108.9)* | 8.0 |
| 2004 | 2,922,024 | 325,857 | 111.9 (111.5–112.2) * | 11.3 |
| 2005 | 2,958,366 | 333,294 | 113.0 (112.6–113.4) * | 12.4 |

* Age–sex standardized rate per 1000 patients (95% CI)

with the study practices. Prescribing data were also used to determine the total number of asthma-related prescriptions issued by QRESEARCH practices in each year of study.

All analyses were conducted using de-identified data and were subject to the QRESEARCH research governance process.

### Definitions

Asthma was defined as patients who have Read codes H33 and below (Box 1). Asthma-related prescriptions were defined according to the new General Medical Services contract.[10] These drugs included bronchodilators (British National Formulary [BNF] chapter 3.1), inhaled corticosteroids (BNF chapter 3.2), and cromoglycates and related therapies (BNF chapter 3.3). In England, these drugs can only be prescribed by a clinician, usually based in a primary care practice.

### Statistical methods

As a result of known age and sex variations, rates of disease and prescribing were standardized by sex and five-year age bands. The mid-year population estimates for England in each year of study were used as the reference population. These results were then used to estimate the numbers of people with asthma in England. Where appropriate, $\chi^2$ tests were used to test whether there were statistical associations between categorical variables. The Mantel-Haenszel $\chi^2$ test was used to investigate trends over time, this analysis being undertaken using EpiInfo2000 (Centers for Disease Control and Prevention, Atlanta, Georgia, USA). Where appropriate, 95% confidence intervals (95% CI) are reported.

## Results

We estimated that 261,400 (95% CI 257,200–265,700) of 50 million people in England were newly diagnosed with asthma in 2005. We estimated that 5,658,900 (95% CI 5,639,700–5,678,200) had a GP recorded diagnosis of asthma, this translating into approximately one person in nine being diagnosed with asthma at some point in their lives. An estimated 3,257,000 (95% CI 3,242,400–3,271,600) people with asthma were prescribed an asthma-related drug. An estimated total of 32,577,300 (95% CI 32,531,600–32,623,000) asthma-related prescriptions were issued to patients in England in 2005.

### Trends in incidence rate

Between 2001 and 2005, there was a decrease in the incidence rate of asthma in England (Table 1). Decreases in incidence were found in all groups of patients, the largest of which was in pre-school children (i.e. <5 years; Table 2). The incidence rate

**Table 2**
**Incidence rate of asthma by gender, age and socioeconomic status**

| *Group* | *Year* | *Total patients (n)* | *New patients with asthma (n)* | *Age–sex standardized rate per 1000 patient-years (95% CI)** | *Relative % change in standardized rate (from 2001)* |
|---|---|---|---|---|---|
| *Gender* | | | | | |
| Women | 2001 | 1,444,314 | 10,241 | 7.3 (7.2–7.4) | |
| | 2005 | 1,485,738 | 8159 | 5.6 (5.5–5.7) | –23.2 |
| Men | 2001 | 1,420,624 | 8642 | 6.5 (6.4–6.6) | |
| | 2005 | 1,472,628 | 6711 | 4.8 (4.7–4.9) | –25.8 |
| *Age band (years)* | | | | | |
| 0–4 | 2001 | 126,348 | 2891 | 22.9 (22.1–23.7) | |
| | 2005 | 125,020 | 1781 | 14.3 (13.6–14.9) | –38.4 |
| 5–14 | 2001 | 366,063 | 4153 | 11.4 (11.0–11.7) | |
| | 2005 | 361,784 | 3033 | 8.4 (8.1–8.7) | –27.0 |
| 15–44 | 2001 | 1,187,858 | 6248 | 5.3 (5.1–5.4) | |
| | 2005 | 1,226,462 | 5459 | 4.5 (4.3–4.6) | –12.6 |
| 45–64 | 2001 | 710,416 | 3429 | 4.8 (4.7–5.0) | |
| | 2005 | 757,380 | 2892 | 3.8 (3.7–4.0) | –15.7 |
| 65+ | 2001 | 474,253 | 2162 | 4.6 (4.4–4.8) | |
| | 2005 | 487,720 | 1705 | 3.5 (3.3–3.7) | –21.1 |
| *Deprivation* | | | | | |
| Quintile 1† | 2001 | 634,434 | 3785 | 6.3 (6.1–6.5) | |
| | 2005 | 648,634 | 2834 | 4.6 (4.4–4.8) | –26.5 |
| Quintile 2 | 2001 | 565,812 | 3440 | 6.5 (6.2–6.7) | |
| | 2005 | 580,431 | 2681 | 4.9 (4.7–5.1) | –24.2 |
| Quintile 3 | 2001 | 536,218 | 3489 | 6.9 (6.7–7.1) | |
| | 2005 | 552,702 | 2783 | 5.3 (5.1–5.5) | –22.9 |
| Quintile 4 | 2001 | 497,925 | 3515 | 7.4 (7.1–7.6) | |
| | 2005 | 515,271 | 2765 | 5.5 (5.3–5.8) | –24.8 |
| Quintile 5 | 2001 | 535,216 | 4139 | 8.0 (7.7–8.2) | |
| | 2005 | 567,835 | 3361 | 6.0 (5.8–6.2) | –24.2 |

* Crude rates are reported by age band
† Most affluent group of patients

of asthma was highest in this age group (when compared to older age groups) with one person in 70 being newly diagnosed in 2005.

## Trends in lifetime prevalence

Over the study period, the recorded lifetime prevalence of asthma increased (Table 1). The recorded lifetime prevalence for different groups of patients with asthma can be seen in Table 3. School-aged children (i.e. 5–14 years) had the highest lifetime prevalence of asthma, with almost one in six having been diagnosed with asthma at some point in their lives. Significant decreases in lifetime prevalence over time were found in pre-school and school-aged children ($p<0.001$). Significant increases occurred in all other age groups ($p<0.001$).

## Trends in asthma-related prescribing

The rate of asthma-related prescriptions per 1000 patients increased during the study period from 556.6 per 1000 (95% CI 554.7–556.4) in 2001 to 650.3 per 1000 patients (95% CI 649.4–651.2) in 2005, this representing a 17.1% rise ($p<0.001$). Older patients (>65 years) received the most prescriptions per head of population (Table 4). Over the study period, the rate of asthma-related prescriptions increased in all groups except for pre-school children

**Table 3**
**Lifetime prevalence rate of asthma by gender, age and socioeconomic status**

| *Group* | *Year* | *Total patients (n)* | *Patients with asthma (n)* | *Age–sex standardized rate per 1000 patients (95% CI)** | *Relative % change in standardized rate (from 2001)* |
|---|---|---|---|---|---|
| *Gender* | | | | | |
| Women | 2001 | 1,444,314 | 145,253 | 100.6 (100.1–101.1) | |
| | 2005 | 1,485,738 | 170,631 | 114.5 (113.9–115.0) | 13.8 |
| Men | 2001 | 1,420,624 | 140,688 | 100.3 (99.8–100.9) | |
| | 2005 | 1,472,628 | 162,663 | 111.4 (110.9–112.0) | 25.8 |
| *Age band (years)* | | | | | |
| 0–4 | 2001 | 126,348 | 7963 | 63.0 (61.7–64.6) | |
| | 2005 | 125,020 | 5231 | 41.8 (40.7–43.0) | –34.3 |
| 5–14 | 2001 | 366,063 | 59,285 | 161.9 (160.8–131.5) | |
| | 2005 | 361,784 | 56,702 | 156.7 (155.5–157.9) | –4.4 |
| 15–44 | 2001 | 1,187,858 | 126,226 | 106.3 (105.7–106.8) | |
| | 2005 | 1,226,462 | 155,670 | 126.9 (126.3–127.5) | 23.3 |
| 45–64 | 2001 | 710,416 | 53,951 | 75.9 (75.3–76.6) | |
| | 2005 | 757,380 | 68,885 | 91.0 (90.3–91.6) | 27.7 |
| 65+ | 2001 | 474,253 | 38,516 | 81.2 (80.4–82.0) | |
| | 2005 | 487,720 | 46,806 | 96.0 (95.1–96.8) | 21.5 |
| *Deprivation* | | | | | |
| Quintile 1† | 2001 | 634,434 | 60,048 | 97.7 (96.9–99.0) | |
| | 2005 | 648,634 | 69,710 | 111.2 (110.3–112.0) | 13.8 |
| Quintile 2 | 2001 | 565,812 | 54,517 | 98.7 (97.9–99.6) | |
| | 2005 | 580,431 | 63,721 | 112.4 (111.5–113.3) | 13.8 |
| Quintile 3 | 2001 | 536,218 | 54,041 | 101.7 (100.9–102.6) | |
| | 2005 | 552,702 | 62,860 | 114.3 (113.4–115.2) | 12.3 |
| Quintile 4 | 2001 | 497,925 | 52,084 | 104.7 (103.8–105.6) | |
| | 2005 | 515,271 | 60,718 | 117.3 (116.4–118.3) | 12.1 |
| Quintile 5 | 2001 | 535,216 | 57,122 | 106.5 (105.6–107.4) | |
| | 2005 | 567,835 | 67,365 | 119.0 (118.1–119.9) | 11.7 |

* Crude rates are reported by age band
† Most affluent group of patients

in whom there was a decrease in the rate of prescribing for asthma treatments ($p<0.001$).

### Socioeconomic variations

There were substantial socioeconomic differences found in the rates of asthma, with the most deprived (quintile 5) having higher incidence (Table 2) and lifetime prevalence of asthma (Table 3) and higher rates of being prescribed asthma-related drugs (Table 4) than the most affluent patients (quintile 1; $p<0.001$).

## Discussion

This study, using routinely collected electronic data from one of the world's largest national data-sets, has confirmed that asthma is extremely common, and that despite an apparent decrease in the number of people newly presenting with the disease, the number of those with a lifetime diagnosis and prescriptions of asthma-related drugs issued by primary care continues to grow. However, conversely, we have found evidence that in children, the rate of new and lifetime diagnosed prevalence of asthma and the issuing of asthma-related prescriptions (for pre-school children < 5 years) appears to be declining. Substantial socioeconomic differences were also found in the rates of asthma, with the most deprived having higher incidence and lifetime prevalence of asthma and higher rates of being prescribed an asthma-related drug.

**Table 4**
**Asthma-related prescribing by gender, age and socioeconomic status**

| *Group* | *Year* | *Total patients (n)* | *Prescriptions (n)* | *Prescriptions per 1000 patients per year (95% CI)** | *Relative % change in standardized rate (from 2001)* |
|---|---|---|---|---|---|
| *Gender* | | | | | |
| Women | 2001 | 1,444,314 | 865,409 | 587.3 (586.1–588.6) | |
| | 2005 | 1,485,738 | 1,076,906 | 709.4 (708.1–710.8) | 20.8 |
| Men | 2001 | 1,420,624 | 751,682 | 522.4 (521.2–523.6) | |
| | 2005 | 1,472,628 | 882,996 | 588.9 (587.6–590.1) | 12.7 |
| *Age band (years)* | | | | | |
| 0–4 | 2001 | 126,348 | 32,870 | 260.2 (257.7–262.8) | |
| | 2005 | 125,020 | 25,896 | 207.1 (204.9–209.4) | –21.2 |
| 5–14 | 2001 | 366,063 | 174,124 | 475.7 (474.1–477.3) | |
| | 2005 | 361,784 | 177,625 | 490.1 (489.3–492.6) | 2.0 |
| 15–44 | 2001 | 1,187,858 | 443,838 | 373.7 (372.8–374.5) | |
| | 2005 | 1,226,462 | 529,168 | 431.4 (430.6–432.3) | 19.2 |
| 45–64 | 2001 | 710,416 | 445,052 | 626.5 (625.3–627.6) | |
| | 2005 | 757,380 | 576,942 | 761.8 (760.8–762.7) | 29.6 |
| 65+ | 2001 | 474,253 | 521,207 | 1099.0 (1096.0–1102.0) | |
| | 2005 | 487,720 | 650,271 | 1333.3 (1330.0–1336.5) | 24.8 |
| *Deprivation* | | | | | |
| Quintile 1† | 2001 | 634,434 | 306,829 | 468.1 (466.4–469.8) | |
| | 2005 | 648,634 | 371,855 | 541.9 (540.1–543.7) | 15.8 |
| Quintile 2 | 2001 | 565,812 | 292,763 | 499.8 (498.0–501.7) | |
| | 2005 | 580,431 | 357,904 | 583.8 (581.9–585.8) | 16.8 |
| Quintile 3 | 2001 | 536,218 | 309,274 | 561.8 (559.8–563.8) | |
| | 2005 | 552,702 | 375,716 | 659.1 (657.0–661.2) | 17.3 |
| Quintile 4 | 2001 | 497,925 | 313,379 | 635.9 (633.7–638.1) | |
| | 2005 | 515,271 | 375,532 | 749.3 (746.9–751.7) | 17.8 |
| Quintile 5 | 2001 | 535,216 | 358,819 | 719.8 (717.4–722.1) | |
| | 2005 | 567,835 | 438,293 | 865.1 (862.5–867.7) | 20.2 |

* Crude rates are reported by age band
† Most affluent group of patients

## Main strengths and limitations of this work

The main strengths of this study include our interrogation of patient-level computerized data from an extremely large nationally representative dataset, the fact that all contributing practices used the same computing systems for electronically recording clinical data, the approach used to ensure that all contributing practices were accustomed to electronically recording routine data, and the use of contemporaneous clinician recording of a diagnosis of asthma as opposed to patient self- or parental reporting of historical diagnoses or symptoms. The study design employed ensured that there was no risk of selection bias due to non-responders or recall bias.

There are a number of limitations related to the use of large routinely collected data from primary care, including the dependence on clinician-recorded diagnosis of asthma (especially as diagnostic tests [e.g. spirometry] used to confirm or refute diagnoses were not available), possible improvements in recording over the study time period and a lack of information on the dispensing of drugs from pharmacies or evidence of patient adherence to prescribed medications. The relatively short time window over which trends were studied is another limitation, and although this did have the advantage of confining analysis to a period during which there were relatively few changes in disease definition, the introduction of the new General Medical Services Contract to UK

**Table 5**
**Comparison of UK epidemiological data for asthma**

| *Source* | *Time period* | *Age group* | *Outcome measured* | *Results* | *Change over time* |
|---|---|---|---|---|---|
| MSGP3[26] | 1981–1982 | All patients | Patients with a new episode of asthma | 19.2 per 1000 | 14.7 per 1000 |
| MSGP4[27] | 1991–1992 | All patients | Patients with a new episode of asthma | 33.9 per 1000 | |
| ISAAC Phase One[28] | 1995–1996 | 6–7 years | 12-month period prevalence self-reported wheezing or whistling in UK | 18.4% | 2.5% |
| ISAAC Phase Three[28] | 2002–2003 | 6–7 years | 12-month period prevalence self-reported wheezing or whistling in UK | 20.9% | |
| ISAAC Phase One[28] | 1995–1996 | 13–14 years | 12-month period prevalence self-reported wheezing or whistling in UK | 31.0% | –6.3% |
| ISAAC Phase Three[28] | 2002–2003 | 13–14 years | 12-month period prevalence self-reported wheezing or whistling in UK | 24.7% | |
| Aberdeen School Children Cohort[29] | 1964–1999 | 10.6 years (mean) | Self-reported prevalence of ever having asthma | 4.0% to 24.0% | 20.0% |
| HSE[30] | 1995–1996 | Men | Lifetime prevalence of doctor-diagnosed asthma | 11.0% | 2.0% |
| HSE[30] | 2000–2001 | Men | Lifetime prevalence of doctor-diagnosed asthma | 13.0% | |
| HSE[30] | 1995–1996 | Women | Lifetime prevalence of doctor-diagnosed asthma | 12.0% | 4.0% |
| HSE[30] | 2000–2001 | Women | Lifetime prevalence of doctor-diagnosed asthma | 16.0% | |

MSGP – Morbidity Statistics from General Practice; ISAAC – The International Study of Asthma and Allergies in Childhood; HSE – Health Survey for England

primary care in April 2004, which introduced incentives to create and maintain a registry of patients with asthma (aged over 8 years and with one asthma-related prescription), may have influenced the prevalence of asthma toward the latter end of the study period. Data regarding childhood incidence and prevalence may be underestimated, as the ascertainment of disease present in the community will be dependent on parents bringing their children for consultation.[11] The inadequacy of Read codes for asthma (as well as other allergy-related conditions) has previously been reported and this may have contributed to under-recording.[12] Prescribing data are not available by clinical indication and, therefore, it is possible that for a proportion of older patients, prescriptions for other respiratory diseases such as chronic obstructive pulmonary disease are included.

## Comparison of findings with other published work

Our findings suggest that the increasing trend in lifetime physician-diagnosed asthma found in repeated surveys (Table 5) and by the large UK electronic General Practice Research Database (GPRD) between 1990 and 1998 (5% to 9%) continued between 2001 and 2005 in the QRESEARCH database (10% to 11%).[13] Recent declines that were found in the incidence of asthma for school-age children aged 5–14 years (GPRD 1990–1998: 3.2% to 1.5%) appear also to have continued (QRESEARCH 2001–2005: 1.1% to 0.8%). A declining prevalence of asthma in children has been reported during a similar time period (2000–2005) in Australia.[14] Our estimated rate of 34 million prescriptions in 2005 is somewhat lower than reported elsewhere (39.8 million).[3] The association of asthma incidence and prevalence with socioeconomic deprivation has been previously described.[15]

## Meaning of the study results: possible mechanisms and implications for clinicians and policymakers

Our data could be interpreted as indicating that asthma may now be decreasing in children. However, these results need to be interpreted in the context of other studies, which have reported

increases over the same time period (using QRESEARCH data) in the prevalence of eczema, allergic rhinitis and multiple allergies in children,[7–9] increases in atopic sensitization in repeated UK birth cohorts over a 25-year window,[16] and increases in the prevalence of asthma globally.[17] It is, therefore, likely that rather than a reduction of more persistent wheezing associated with allergic sensitization (i.e. the 'classic' asthma phenotype),[18] what we may be witnessing is the impact of revised national asthma guidelines,[19] with the recognition that infants and pre-school children who wheeze may not be asthmatics, but are wheezing secondary to small airway or respiratory viral infections thus resulting in a diagnostic shift from 'asthma' to labels such as 'wheeze' or 'acute respiratory infection'.[20] For adults, the reduction in incidence rates could also reflect a growing concern that, after years of under-diagnosis, asthma may now be over-diagnosed in primary care.[10] It is also possible that the observed changes in disease incidence and prevalence could have been affected by the introduction of the new incentivized General Medical Services contract, whereby payments are made to practices to keep accurate registers of patients with diseases such as asthma.[21] However, despite these changes in recorded incidence, increases in the lifetime prevalence of asthma and asthma-related prescribing appears to be continuing, such that by 2005 an estimated 5.7 million people in England were diagnosed with asthma, with over half of these (3 million) requiring recent medical treatment. It is possible that this is the result of changes in environmental factors over time which has favoured the expression of allergic disease in those who are genetically susceptible.[22] However, it is also possible that increases in the rate of these conditions could have resulted from increased clinician awareness of allergic problems, which may then have led to improved identification and recording of asthma. Similarly, increased patient awareness of the potential of accessing effective treatments may have resulted in increased case presentation and prescribing in primary care. Although data were not available on smoking, it is likely that higher rates of smoking among the more socioeconomically-deprived groups of patients[23] will have contributed to the substantial socioeconomic differences found in the rates of asthma and asthma-related prescribing.

Whatever the cause, the increasing number of people with asthma in England poses a substantial disease burden on primary care services.[24,25]

## Conclusions and future research

This large national study reveals that the rate of new diagnoses of asthma appears to have passed its peak. However, the number of adults with a lifetime asthma diagnosis continues to rise. Whether these trends are genuine or are a result of the introduction of incentives and guidelines to improve identification and recording of asthma or changing diagnostic trends is a question with important public health implications and one, therefore, that warrants detailed further enquiry.

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